

## **DRAFT**

### **CONSULTANT SERVICES AGREEMENT BETWEEN CITY OF SUNNYVALE AND BASE ENERGY, INC., TO PERFORM AN ENERGY USE AUDIT OF THE HOT WATER LOOP AT CITY'S WATER POLLUTION CONTROL PLANT**

THIS AGREEMENT dated \_\_\_\_\_ is by and between the CITY OF SUNNYVALE, a municipal corporation ("CITY"), and BASE Energy, Inc., a California corporation ("CONSULTANT").

WHEREAS, CITY desires to secure professional services necessary for investigation, analysis, design, preparation of construction drawings and contract specifications, consultation, services during construction and other services for a project known as "Energy Use Audit of the Hot Water Loop at CITY's Water Pollution Control Plant"; and

WHEREAS, CONSULTANT represents that it, and its sub-consultants, if any, possess the professional qualifications and expertise to provide the required services and are licensed by the State of California to practice engineering in the required disciplines;

NOW, THEREFORE, THE PARTIES ENTER INTO THIS AGREEMENT.

1. **Services by CONSULTANT**

CONSULTANT shall provide services in accordance with Exhibit "A" entitled "Scope of Work." All exhibits referenced in this Agreement are attached hereto and are incorporated herein by reference. To accomplish that end, CONSULTANT agrees to assign Ahmad R. Ganji, Ph.D. to this project, to act in the capacity of Project Manager and personally direct the professional services to be provided by CONSULTANT.

Except as specified in this Agreement, CONSULTANT shall furnish all technical and professional services, including labor, material, equipment, transportation, supervision and expertise to perform all operations necessary and required to satisfactorily complete the services required in this Agreement.

2. **Notice to Proceed/Completion of Services**

- (a) CONSULTANT shall commence services upon receipt of written Notice to Proceed from CITY. Notice shall be deemed to have occurred three (3) calendar days after deposit in the regular course of the United States mail.
- (b) When CITY determines that CONSULTANT has satisfactorily completed the services defined in Exhibit "A," CITY shall give CONSULTANT written Notice of Final Acceptance, and CONSULTANT shall not incur any further costs hereunder. CONSULTANT may request this determination of completion when, in its opinion, it has satisfactorily completed the Scope of Work (Exhibit "A"), and if so requested, CITY shall make this determination within fourteen (14) days of such request.

3. **Project Schedule**

The Project Schedule is set forth in the attached Exhibit "A-1."

4. Payment of Fees and Expenses

Payments shall be made to CONSULTANT on a monthly basis as set forth in the attached Exhibit "B" entitled "Compensation Schedule." All compensation will be based on monthly billings as provided in Exhibit "B." Compensation will not be due until said detailed billing is submitted to CITY within a reasonable time before payment is expected to allow for normal CITY processing. An estimate of the percent of total completion associated with the various categories of the services shall be furnished by CONSULTANT with said billing. When applicable, copies of pertinent financial records will be included with the submission of billing(s) for all direct reimbursables. Compensation shall not exceed the amounts set forth in Exhibit "B" for each phase. In no event shall the total amount of compensation payable under this agreement exceed the sum of One Hundred Eighty Four Thousand Nine Hundred Twelve and no/100 Dollars (\$184,912.00) unless upon written modification of this Agreement. All invoices, including detailed backup, shall be sent to City of Sunnyvale, attention Accounts Payable, P.O. Box 3707, Sunnyvale, CA 94088-3707.

5. No Assignment of Agreement

CONSULTANT agrees to bind itself, its partners, successors, assigns, executors, and administrators to all covenants of this Agreement. Except as otherwise set forth in this Agreement, no interest in this Agreement or any of the work provided for under this Agreement shall be assigned or transferred, either voluntarily or by operation of law, without the prior written approval of CITY. However, claims for money due to or to become due to CONSULTANT from CITY under this Agreement may be assigned to a bank, trust company or other financial institutions, or to a trustee in bankruptcy, provided that written notice of any such assignment or transfer shall be first furnished to CITY. In case of the death of one or more members of CONSULTANT's firm, the surviving member or members shall complete the services covered by this Agreement. Any such assignment shall not relieve CONSULTANT from any liability under the terms of this Agreement.

6. Consultant is an Independent Contractor

CONSULTANT is not an agent or employee of CITY but is an independent contractor with full rights to manage its employees subject to the requirements of the law. All persons employed by CONSULTANT in connection with this Agreement will be employees of CONSULTANT and not employees of CITY in any respect. CONSULTANT is responsible for obtaining statutory Workers' Compensation coverage for its employees.

7. Consultant's Services to be Approved by a Registered Professional

All reports, costs estimates, plans and other documents which may be submitted or furnished by CONSULTANT shall be approved and signed by a qualified registered professional in the State of California. The title sheet for calculations, specifications and reports, and each sheet of plans, shall bear the professional seal, certificate number, registration classification, expiration date of certificate and signature of the professional responsible for their preparation.

8. Standard of Workmanship

CONSULTANT represents and maintains that it is skilled in the professional calling necessary to perform the services and its duties and obligations, expressed and implied, contained herein, and CITY expressly relies upon CONSULTANT's representations regarding its skills and knowledge. CONSULTANT shall perform such services and duties in conformance to and consistent with the standards generally recognized as being employed by professionals in the same discipline in the State of California.

The plans, designs, specifications, estimates, calculations reports and other documents furnished under the Scope of Work (Exhibit "A") shall be of a quality acceptable to CITY. The criteria for acceptance of the work provided under this Agreement shall be a product of neat appearance, well-organized, technically and grammatically correct, checked and having the maker and checker identified. The minimum standard of appearance, organization and content of the drawings shall be that used by CITY for similar projects.

9. Responsibility of CONSULTANT

CONSULTANT shall be responsible for the professional quality, technical accuracy and the coordination of the services furnished by it under this Agreement. Neither CITY's review, acceptance nor payment for any of the services required under this Agreement shall be construed to operate as a waiver of any rights under this Agreement or of any cause of action arising out of the performance of this Agreement and CONSULTANT shall be and remain liable to CITY in accordance with applicable law for all damages to CITY caused by CONSULTANT's negligent performance of any of the services furnished under this Agreement.

Any acceptance by CITY of plans, specifications, calculations, construction contract documents, reports, diagrams, maps and other material prepared by CONSULTANT shall not, in any respect, absolve CONSULTANT for the responsibility CONSULTANT has in accordance with customary standards of good engineering practice in compliance with applicable Federal, State, County and/or municipal laws, ordinances, regulations, rules and orders.

10. Right of CITY to Inspect Records of CONSULTANT

CITY, through its authorized employees, representatives, or agents, shall have the right, at any and all reasonable times, to audit the books and records including, but not limited to, invoices, vouchers, canceled checks, time cards of CONSULTANT for the purpose of verifying any and all charges made by CONSULTANT in connection with this Agreement. CONSULTANT shall maintain for a minimum period of three (3) years from the date of final payment to CONSULTANT or for any longer period required by law, sufficient books and records in accordance with generally accepted accounting practices to establish the correctness of all charges submitted to CITY by CONSULTANT. Any expenses not so recorded shall be disallowed by CITY.

11. Confidentiality of Material

All ideas, memoranda, specifications, plans, calculations, manufacturing procedures, data, drawings, descriptions, documents, discussions or other information developed or received by or for CONSULTANT and all other written information submitted to CONSULTANT in connection with the performance of this Agreement shall be held confidential by CONSULTANT and shall not, without the prior written consent of CITY be used for any purposes other than the performance of the Project services, nor be disclosed to an entity not connected with the performance of the Project services. Nothing furnished to CONSULTANT which is otherwise known to CONSULTANT or is or becomes generally known to the related industry shall be deemed confidential. CONSULTANT shall not use CITY's name, insignia or distribute exploitative publicity pertaining to the services rendered under this Agreement in any magazine, trade paper, newspaper or other medium without the express written consent of CITY.

12. No Pledging of CITY's Credit

Under no circumstances shall CONSULTANT have the authority or power to pledge the credit of CITY or incur any obligation in the name of CITY.

### 13. Ownership of Material

All material, including information developed on computer(s), which shall include, but not be limited to, data, sketches, tracings, drawings, plans, diagrams, quantities, estimates, specifications, proposals, tests, maps, calculations, photographs, reports and other material developed, collected, prepared or caused to be prepared, under this Agreement shall be the property of CITY, but CONSULTANT may retain and use copies thereof.

CITY shall not be limited, in any way, in its use of said material, at any time, for work associated with Project. However, CONSULTANT shall not be responsible for damages resulting from the use of said material for work other than Project, including, but not limited to the release of this material to third parties for work other than on Project.

14. Hold Harmless/Indemnification

To the extent permitted by law, CONSULTANT agrees to indemnify and hold harmless CITY, its officers and employees from any and all claims, demands, actions, causes of action, losses, damages, liabilities, known or unknown, and all costs and expenses, including reasonable attorneys' fees in connection with any injury or damage to persons or property to the extent arising out of any negligent act, error, omission or negligence of CONSULTANT, its officers, employees, agents, contractor, subcontractors or any officer, agent or employee thereof in relation to CONSULTANT's performance under this Agreement. Such defense and indemnification shall not apply in any instance of and to the extent caused by the sole negligence or willful misconduct of CITY, its officers, employees, agents or representatives.

## 15. Insurance Requirements

CONSULTANT shall take out and maintain during the life of this Agreement policies of insurance as specified in Exhibit "C" attached and incorporated by reference, and shall provide all certificates and/or endorsements as specified in Exhibit "C."

16. No Third Party Beneficiary

This Agreement shall not be construed or deemed to be an agreement for the benefit of any third party or parties and no third party or parties shall have any claim or right of action hereunder for any cause whatsoever.

## 17. Notices

All notices required by this Agreement shall be in writing, and shall be personally delivered, sent by first class mail with postage prepaid, or by commercial courier, addressed as follows:

To CITY: Chuck Neumayer  
Department of Public Works  
CITY OF SUNNYVALE  
P. O. Box 3707  
Sunnyvale, CA 94088-3707

To CONSULTANT: BASE Energy, Inc.  
Attn: Ahmad R. Ganji, Ph.D.  
5 Third Street, Suite 530  
San Francisco, CA 94103

Nothing in this provision shall be construed to prohibit communication by more expedient means, such as by telephone or facsimile transmission, to accomplish timely communication. However, to constitute effective notice, written confirmation of a telephone conversation or an original of a facsimile transmission must be sent by first class mail, by commercial carrier, or hand-delivered. Each party may change the address by written notice in accordance with this paragraph. Notices delivered personally shall be deemed communicated as of actual receipt; mailed notices shall be deemed communicated as of three days after mailing, unless such date is a date on which there is no mail service. In that event communication is deemed to occur on the next mail service day.

18. Waiver

CONSULTANT agrees that waiver by CITY of any one or more of the conditions of performance under this Agreement shall not be construed as waiver(s) of any other condition of performance under this Agreement.

19. Amendments

No alterations or changes to the terms of this Agreement shall be valid unless made in writing and signed by both parties.

20. Integrated Agreement

This Agreement embodies the agreement between CITY and CONSULTANT and its terms and conditions. No verbal agreements or conversation with any officer, agent or employee of CITY prior to execution of this Agreement shall affect or modify any of the terms or obligations contained in any documents comprising this Agreement. Any such verbal agreement shall be considered as unofficial information and in no way binding upon CITY.

21. Conflict of Interest

CONSULTANT certifies that to the best of its knowledge, no CITY employee or officer of any public agency interested in this Agreement has any pecuniary interest in the business of CONSULTANT and that no person associated with CONSULTANT has any interest that would conflict in any manner or degree with the performance of this Agreement.

22. California Agreement

This Agreement has been entered into in the State of California and this Agreement shall be governed by California law.

23. Records, Reports and Documentation

CONSULTANT shall maintain complete and accurate records of its operation, including any and all additional records required by CITY in writing. CONSULTANT shall submit to CITY any and all reports concerning its performance under this Agreement that may be requested by CITY in writing. CONSULTANT agrees to assist CITY in meeting CITY's reporting requirements to the state and other agencies with respect to CONSULTANT's work hereunder. All records, reports and documentation relating to the work performed under this Agreement shall be made available to City during the term of this Agreement.

24. Termination of Agreement

If CONSULTANT defaults in the performance of this Agreement, or materially breaches any of its provisions, CITY at its option may terminate this Agreement by giving written notice to CONSULTANT. If CITY fails to pay CONSULTANT, CONSULTANT at its option may terminate this Agreement if the failure is not remedied by CITY within thirty (30) days from the date payment is due.

Without limitation to such rights or remedies as CITY shall otherwise have by law, CITY also shall have the right to terminate this Agreement for any reason upon ten (10) days' written notice to CONSULTANT. In the event of such termination, CONSULTANT shall be compensated in proportion to the percentage of services performed or materials furnished (in relation to the total which would have been performed or furnished) through the date of receipt of notification from CITY to terminate. CONSULTANT shall present CITY with any work product completed at that point in time.

25. Subcontracting

None of the services covered by this Agreement shall be subcontracted without the prior written consent of CITY. Such consent may be issued with notice to proceed if subcontract consultants are listed in the project work plan.

26. Fair Employment

CONSULTANT shall not discriminate against any employee or applicant for employment because of race, color, creed, national origin, sex, age, condition of physical handicap, religion, ethnic background or marital status, in violation of state or federal law.

27. Changes

CITY or CONSULTANT may, from time to time, request changes in the terms and conditions of this Agreement. Such changes, which are mutually agreed upon by CITY and CONSULTANT, shall be incorporated in amendments to this Agreement.

28. Other Agreements

This Agreement shall not prevent either Party from entering into similar agreements with others.

29. Severability Clause.

In case any one or more of the provisions contained herein shall, for any reason, be held invalid, illegal or unenforceable in any respect, it shall not affect the validity of the other provisions which shall remain in full force and effect.

30. Captions

The captions of the various sections, paragraphs and subparagraphs, of the contract are for convenience only and shall not be considered nor referred to for resolving questions of interpretation.

31. Entire Agreement; Amendment

This writing constitutes the entire agreement between the parties relating to the services to be performed or materials to be furnished hereunder. No modification of this Agreement shall be effective unless and until such modification is evidenced by writing signed by all parties.

32. Miscellaneous

Time shall be of the essence in this Agreement. Failure on the part of either party to enforce any provision of this Agreement shall not be construed as a waiver of the right to compel enforcement of such provision or any other provision. This Agreement shall be governed and construed in accordance with the laws of the State of California.

IN WITNESS WHEREOF, the parties have executed this Agreement.

ATTEST:

CITY OF SUNNYVALE ("CITY")

By \_\_\_\_\_  
City Clerk

By \_\_\_\_\_  
City Manager

BASE Energy, Inc.  
("CONSULTANT")

APPROVED AS TO FORM:

By \_\_\_\_\_  
\_\_\_\_\_  
Name/Title

By \_\_\_\_\_  
City Attorney

By \_\_\_\_\_  
\_\_\_\_\_  
Name/Title

## **EXHIBIT A**

### **Project Scope and Work Plan**

#### **Project Background**

The hot water loop of the City of Sunnyvale Water Pollution Control Plant (WPCP) has been designed to absorb heat from raw sewage pump engines and Power Generation Facility (PGF) engines and distribute the heat throughout the WPCP for various applications. The loop absorbs the heat from the cooling loop and exhaust of three 212 hp raw sewage pumps engines and the cooling circuit of two 800 kW Caterpillar engine generators. Based on the supplied schematics, the raw sewage engines generate low-pressure steam which, in turn, produces hot water that is pumped into the hot water loop. The water is heated to 180-200 F in the engine heat exchangers.

The original loop, which included the raw sewer pumps engines, was installed in the 1950s. Some piping replacement and upgrades were performed in the 1980s, and the PGF engines were installed in 1997-1998. The engines utilize landfill gas (from a nearby landfill), digester gas and natural gas. Natural gas constitutes a small fraction of the fuel. The WPCP also uses some natural gas in a boiler that supplements the heat from the hot water loop from the engines. The produced electricity from the two 800 kW generators is used internally in the WPCP, and a fraction of it (about 150 KW) is exported to the PG&E grid. The heat generated by the engines and distributed through the hot water loop is used for various applications, including:

- Heating the sludge fed to the anaerobic digesters via in line heat exchangers.
- Heating digester sludge via the recirculation sludge spiral heat exchangers.
- Space heating in various buildings.
- Domestic hot water heating for the Tertiary Control and Primary Control buildings.

There are various issues with the loop, some of which are:

- High maintenance costs due to age of most of the components in the loop.
- Inaccessibility of some components for maintenance.
- Heat dumping (from the cooling loop heat exchangers) when there is not enough demand for the heat.
- Isolation of some parts of the hot water loop, such as the Tertiary Control Building and raw sludge loops when sufficient heat is unavailable.
- No heat recovery from the exhaust of PGF engines.
- No heat is used for drying the sludge that goes to the landfill.



- The loop is not optimized for the WPCP, e.g.,
  - Exhaust heat from the 800 KW power generation engines is not utilized.
  - The WPCP sometimes dumps heat when it can be used for cooling some of the buildings.
  - In summer, the WPCP sometimes does not have enough capacity to dump the extra heat.

## Project Scope

The main objective of the project is to assess the condition and operation of the existing hot water loop at the Sunnyvale Water Pollution Control Plant (WPCP) and identify alternatives (the present system may be one) for cost effective production and utilization of electrical, mechanical and thermal energy as related to the hot water loop and the waste water treatment process.

The specific technical objectives of the project are, as follows:

- To assess the mechanical and structural condition of the system and to identify and define the existing deficiencies for both WPCP heat production and heat usage.
- To assess the operational and maintenance of the system.
- To evaluate the effectiveness of the heat generated by the existing treatment processes.
- To evaluate alternatives to the current equipment/systems, utilizing state-of-the-art technology to improve the cost effectiveness of the hot water loop as related to the overall operation of the WPCP.
- To assess, investigate and evaluate the use of new technology (absorption chillers) for cooling several buildings at the WPCP.

Consultant shall perform the following tasks to achieve the objectives of the project. Details of each task and the responsibilities of the parties involved are described in following section.

**Table 1 – Project Tasks**

Task No.	Task Title
1	Project Initiation Meeting and Coordination
2	Inspection and Collection of Information
3	Measurement of Systems Operational Parameters
4	Analysis and Development of Alternatives
5	Reporting
6	Project Management

## Project Work Plan

### **Task 1 – Project Initiation Meeting and Coordination**

The project shall begin with the consultant team meeting with City's project manager and other City staff, as required. This meeting will include the following activities:

- The consultant team shall deliver a presentation on the team's understanding of the goals of the project, go through the tasks envisioned to accomplish the objectives of the project and discuss the expectations, roles and responsibilities with City's project management.
- City staff may also present their understanding of the problems and their vision of the solutions, and a time will be scheduled for the consultant team to take a detailed tour of the applicable portions of the WPCP.
- The consultant team shall present a detailed list of information, documents and resources it may need from City to perform each project task.
- Schedule details will be finalized.

***Deliverable:*** Consultant's project manager shall prepare a document which summarizes the conclusions from the meeting, including any specific agreements, timelines, information and documents to be supplied by the City, and a list of the resources and assistance needed from the City for the consultant team to accomplish the objectives of the project. The document shall be finalized after review by the City's project manager.

***Timeline:*** The initiation meeting shall be held within three weeks following contract execution. The meeting summary document shall be distributed to the concerned parties within three days after the project initiation meeting.

### **Task 2 - Inspection and Collection of Information**

Engineers, expert in the field and representing the consultant team, shall physically inspect all heating loop components to determine the structural, mechanical and operational condition of the each individual component in the loop. This inspection shall provide as-built information about the loop that can be compared to any available loop drawings. Information shall be gathered which includes, but is not limited to, the following:

- Specifications of all mechanical and electrical equipment, including nameplate information for all equipment.
- Physical condition of the components and related equipment and structures that are accessible and not buried, including:
  - Visual inspection of the structural integrity of all components of the system, such as hangers and supports, but not concrete and other building structures.
  - Visual inspection of the components of the systems for corrosion effects.

## EXHIBIT A – SCOPE OF WORK

- Non-destructive test of selected sections of the exposed pipes.
- Inspection of the engines and pumps for excessive vibration and any apparent physical damage or problem. Vibration test results shall be compared to manufacturers' specified thresholds, if any.
- Operational parameters of the processes which will include, but shall not be limited to:
  - All engine operating parameters available from the installed instrumentation.
  - Heat exchanger operating parameters (e.g., inlet and exit temperature for hot and cold flows) from the available installed instrumentation.
  - Pump operating parameters (e.g., inlet and exit pressures, flow) from the available installed instrumentation.
- Identification and inspection of the measurement parameters and points for Task 3, including, but not limited to:
  - Identifying the measurement points for each component.
  - Determining whether spot measurement or time-resolved measurement will be required.
  - Determining the measurement technique(s) for the identified parameters.
  - Determining availability of reliable measurement data from the WPCP measurement and control systems.

Additionally, the consultant team shall:

- Interview WPCP personnel in charge of the operation of the hot water loop with emphasis on the engine, pumps and heat exchanger operations and with the intent of understanding the behavioral dynamics of the system and to identify any operational difficulties encountered.
- Interview WPCP maintenance personnel to collect information about maintenance issues and difficulties with the existing system.
- Collect maintenance records for various components of the loop--especially engines, heat exchangers and pumps.

**Deliverables:** Consultant shall prepare two memos to City's project manager: the first confirming the schedule for the engineering inspection of the loop components and the second providing notice that the needed data and information have been collected and are being processed.

**Timeline:** Inspection shall begin within four weeks following the project initiation meeting and shall be completed within two months. All work will be coordinated with the City's project manager and WPCP management.

**Task 3 – Measurement of System’s Operational Parameters**

The objective of this task is to establish a realistic baseline for analysis of the present system and the prospective alternatives. The measurement of various parameters will facilitate the following:

- Comparison with the original design specifications of the hot water loop.
- Realistic evaluation of the efficiency (in the case of the engines) and effectiveness (in the case of the heat exchangers) of the systems.
- Realistic evaluation of thermal efficiency and overall efficiency of the hot water loop.
- Realistic evaluation of any component/system limitations (whether a specific components acts a bottleneck).

Consultant shall complete the following activities:

- Finalize the parameters and measurement points identified in Task 2, including:
  - Establishing the measurements that are accomplished by the WPCP control and measurement systems.
  - Identifying what other measurements are required and how they can be accomplished. All non-intrusive measurements will be accomplished by the consultant in coordination with the WPCP. The City will be responsible for all intrusive measurements that are required and agreed upon as a part of this task.
- Assure the quality of measured parameters by the WPCP by tracing the calibration of the instruments, determining the reasonableness of data, spot checking the measurements by independent instrumentation, etc.
- Develop measurement protocols which shall include type of instrumentation, recording method, recording duration, etc.
- Install instrumentation and data recording systems.
- Collect data, which shall include an initial test of the instrumentation and recording devices and then final collection of the needed data. The measurement shall be of two categories: For constant load equipment, a few instant measurements shall be made. For variable load equipment, longer term (up to one week) measurements using data loggers shall be made. Non-intrusive measurement equipment shall be supplied by the consultant.
- Quality control of the collected data.
- Data processing, including compiling, sorting and qualification of the data.

## EXHIBIT A – SCOPE OF WORK

The measurements shall include, but shall not be limited to, the parameters in the following table. WPCP influent shall also be recorded by the WPCP and supplied to the consultant during the specified period.

Components / Systems	PGF Engines	Pump Engines	Various HXs.	Sludge HXs	Major Pumps & Blowers	Boiler
<b>Measured Parameters*</b>	Fuel flow	Fuel flow	HS flow	HS flow	Flow	Fuel flow
	Fuel composition (comp.).	Fuel comp.	CS flow	CS flow	Inlet P	HW flow
	Exhaust comp.	Exh. comp.	HS inlet T	HS inlet T	Exit P	Feed Wat. T
	Exhaust. temp.	Exh. temp.	HS exit T	HS exit T	Inlet T, blower	HW P
	Power	CJ inlet T	CS inlet T	CS inlet T	Exit T, blower	HW T
	CJ inlet T	CJ exit T	CS exit T	CS exit T		FGA
	CJ exit T	CJ flow				Exhaust T
	CJ flow					Timing

*Abbreviations:* CJ = cooling jacket, T = temperature (temp), HS = hot side, CS = cold side, HW = hot water, FGA = flue gas analysis, HX = heat exchanger

***Deliverable:*** Consultant shall prepare two memos to the City's project manager: the first providing information about the planned measurements and the second providing notice that the needed data has been extracted and is being processed.

***Timeline:*** The activities in Task 3 shall begin approximately six weeks after the project initiation meeting and will take up to two months to complete. It is estimated that the consultant will make 5-8 visits to the WPCP while completing these activities. All work shall be coordinated with the City's project manager and WPCP personnel.

### **Task 4 - Analysis of the Present Loop and Development of Alternatives**

Based on the data and information collected in Tasks 2 and 3, the consultant shall assess the existing condition of the hot water loop and develop and consider potential alternatives, including a detailed analysis of all process, structural, mechanical, electrical, operation and maintenance issues for each.

Consultant's assessment of the present loop shall provide the City with the following information and analysis:

- Existing mechanical condition of the loop, including the state of the engines, heat recovery heat exchangers, pumps, piping, etc.
- Life cycle cost of the present loop.
- Amount of available fuel energy for conversion into usable mechanical/electrical/heat forms of energy.
- Thermal and overall efficiency of the system.
- Whether heat recovery for wastewater treatment is optimized, i.e., can the WPCP process be improved by enhancing heat transfer to the process?

## EXHIBIT A – SCOPE OF WORK

- Whether other efficiency measures can be introduced or implemented.

Consultant's analysis shall supply the City with the following information about the alternatives, one of which may be to retrofit or replace the existing system:

- Schematics and feasibility of alternatives and preliminary specifications of the alternatives' major components (e.g., engine, pumps, blowers, heat exchangers)
- Process improvements related to wastewater treatment.
- Up-time and reliability as compared to the present system.
- Ease of maintenance .
- Estimated construction cost.
- Operating cost.
- Life cycle cost.

### ***4.a - Evaluation of the Current System and Its Improvement***

Major components of consultant's analysis and assessment shall include the following:

#### **Process**

Evaluation of the process shall include assessment of the process for optimum power generation, heat generation and transfer for maximum digester gas generation, displacement of natural gas usage and minimum electric power usage in the process. To accomplish this task, consultant shall perform a detailed thermal-hydraulic analysis of all components of the loop. The analysis shall include:

- Developing and analyzing the annual profile of electric generation and consumption of the loop, based on the available data at the WPCP.
- Developing and analyzing the annual profile of the heat recovery from the loop, based on the available data at the WPCP.
- Estimating the thermal and overall efficiency of the loop.
- Estimating the maximum and average process heat needs of the WPCP for heating the sludge.
- Estimating other needs for heating and cooling at the WPCP.
- Evaluating the historical need and estimating the future need for electrical power at the WPCP, based on the WPCP's expansion plans, if any.

WPCP staff shall provide to the consultant team historical data for the generation of landfill and digester gases as well as historical data for the export of electricity to PG&E.

## EXHIBIT A – SCOPE OF WORK

### **Mechanical Integrity and Compliance**

Consultant shall evaluate the condition of the mechanical components inspected in Task 2 for:

- Proper sizing of pumps and piping system through analysis of flow profiles,
- Inspection of the engines by a professional engine inspector for proper operation and maintenance
- Present and potential deterioration of the loop due to corrosion through visual inspection
- Insulation integrity of the steam and hot water piping and tanks through visual inspection and thermal measurement.

### **Electrical Integrity and Compliance**

Consultant shall evaluate the condition of the electrical equipment for:

- Code compliance (through inspection by a professional electrical engineer).
- Proper sizing of the motors for the mechanical applications (pumps, fans, etc).
- Efficiency (based on the provisions of 1992 Energy Policy Act).
- Present and potential deterioration (through visual inspection of facilities that are readily observable).

Consultant shall also provide an estimate of the remaining life of the equipment, based on the vintage of equipment and normal life expectancy of the equipment.

### **Structural Integrity**

If consultant determines that the heat loop should be kept online as a useful and beneficial component of the WPCP systems, consultant shall have the installation and anchoring of loop components and their code compliance evaluated by a professional structural engineer.

### **Monitoring and Control**

Based on data and information gathered in Tasks 2 and 3, consultant shall identify any shortcoming, deficiency and obsolescence of the hot water loop measurement, control and monitoring systems and make recommendations for improvements, if appropriate.

### **Operation and Maintenance**

Consultant shall document an existing and prospective issues with the operation and maintenance of the hot water loop by analyzing personnel interviews and maintenance records, including:

## EXHIBIT A – SCOPE OF WORK

- Ease of operation of the system (based on interviews with operations personnel and WPCP management).
- Dependence of system availability on the presence of expert personnel (based on interviews with operations personnel and WPCP management).
- Dependence of system availability on personnel expertise (based on interviews with operations and maintenance personnel and WPCP management).
- System reliability and up-time (based on maintenance and electric export records).
- Frequency of maintenance and recurring maintenance issues (based on maintenance and purchasing records).
- Ease of maintenance (based on interviews with maintenance personnel and WPCP management and inspection of equipment with frequent maintenance needs).
- Availability of parts for maintenance (based on interviews with maintenance personnel and management and purchasing records).

### **Operating Costs**

Consultant shall provide a realistic estimation of the operating cost of the system. Major components that will affect the running cost of the system include:

- Operation personnel cost (based on WPCP records).
- Maintenance costs (personnel and material, based on WPCP records).
- Digester gas cost (Btu-based, as compared to natural gas).
- Cost of electrical energy for running the system (based on inventory and run-time of electrical equipment)

### **Life Cycle Cost**

Consultant shall perform a life cycle cost analysis (LCCA) of the proposed alternatives for the hot water loop, including upgrading and maintaining the existing system. This analysis shall take into consideration capital investments, financing costs, tax implications, energy costs, operation and maintenance costs, discount rates, inflation rates (forecasted) and other potential benefits.

#### ***4.b - Development and Evaluation of Alternatives***

While considering the new and proven technologies, consultant shall propose and evaluate alternatives. Consultant shall consider alternatives that could substantially improve the following attributes of the system:

- Reduce cost and frequency of maintenance.
- Have attractive life cycle cost.



## EXHIBIT A – SCOPE OF WORK

- Improve waste water treatment process including increased throughput.
- Reduce WPCP's operating costs.
- Improve electricity export revenue.
- Accommodate future expansion.
- Improve heat utilization in the WPCP, including reducing or eliminating of hot water dump.
- Utilize now un-captured heat in the exhaust gas of PGF engines.
- Utilize extra heat for heating or cooling of nearby facilities.
- Displace natural gas usage at the WPCP.
- Utilize heat in drying sludge and reduce the cost of landfilling.
- Improve raw sewage pumping power usage by using improved engine efficiency or using electric technology and new electric generators, including the evaluation of the effectiveness of operation of the present raw sewage pump-engine systems and the option of replacing them with electric powered pumps while using the fuel to produce electricity and heat through new engines.
- No heat loop shall also be considered as an alternative if it results in overall cost savings for the WPCP.

In the case of cost effective options, consultant shall provide design criteria and guidelines for selection of proper equipment.

### ***4.c - Inspection and Evaluation of the HVAC System of Laboratory, Administration and Primary Buildings***

Consultant shall inspect and evaluate the HVAC system for the Laboratory Administration and Primary buildings for age, efficiency, and maintenance. All HVAC equipment shall be inspected and evaluated for size, energy efficiency (based on California Title 24 and state-of-the-art technology), maintenance and the comfort of the occupants. Consultant shall make recommendations for retrofit/upgrade (potentially in integration with the hot water loop improvements, such as use of absorption chillers), if appropriate. Consultant shall also analyze the possibility of capturing unused heat in a central absorption chiller for production of chilled water to replace all or part of the current cooling systems in these buildings and evaluate and present an alternative to the present cooling systems, if feasible.

***Deliverable:*** Consultant shall provide a letter report to the City's project manager on task progress and summaries of analyses of current system and alternatives. Regular monthly progress reports shall also be provided.

***Timeline:*** This task shall begin approximately one month after the start of Task 2 and continue for approximately six months.

**Task 5 - Reporting**

Consultant shall perform the following activities:

- Prepare monthly progress reports and submit them to the City's project manager by the 5<sup>th</sup> of the following month. Monthly progress reports shall include:
  - Work performed during the month.
  - The timeliness of the tasks, problems encountered and the planned work for the coming month.
- Attend monthly project meetings between BASE project manager, Kennedy Jenks project manager and the City's project manager (and other City personnel, as required) for review of the project progress, and preparation for the future work. The meeting will be convened at the convenience of the participants after submission of each monthly progress report.
- Prepare a draft of the final report, meeting the schedule prepared in Task 1, for the review of the City's project manager and other City personnel, as required.
- Prepare a final report of the project, based on the comments and reviews of the draft City staff members.
- In conjunction with Kennedy Jenks, deliver an interim presentation on the project (if requested by the City) and a final presentation on the project.

***Deliverable:*** Draft and final project reports and interim and final presentations as well as monthly project meetings.

***Timeline:*** The draft of the final report shall be delivered to the City's project manager no later than eight months after the date of the project initiation meeting. Assuming that it will take the City two weeks to review the report, the final report shall be delivered to the City's project manager no later than nine months after the date of the project initiation meeting.

***Preliminary Structure of Final Report***

Section 1. Executive Summary

Section 2. Introduction & Background

Section 3. Data Review

Section 4. Systems Operation Parameters

Section 5. Alternatives Considered

Section 6. Conclusions & Recommendations

Section 7. References

## EXHIBIT A – SCOPE OF WORK

Appendix Information and Cut Sheets for the Recommended Equipment and System improvements.

### ***Task 6 – Project Management***

Dr. Ganji, P.E, BASE principal, shall manage the technical and administrative aspects of the project on behalf of BASE Energy, Inc. Representatives of Kennedy Jenks Consultants shall be included on the consultant team as a subcontractor of BASE Energy, Inc. Mike Joyce, P.E., shall manage the technical and administrative aspects of the project on behalf of Kennedy Jenks subcontract.

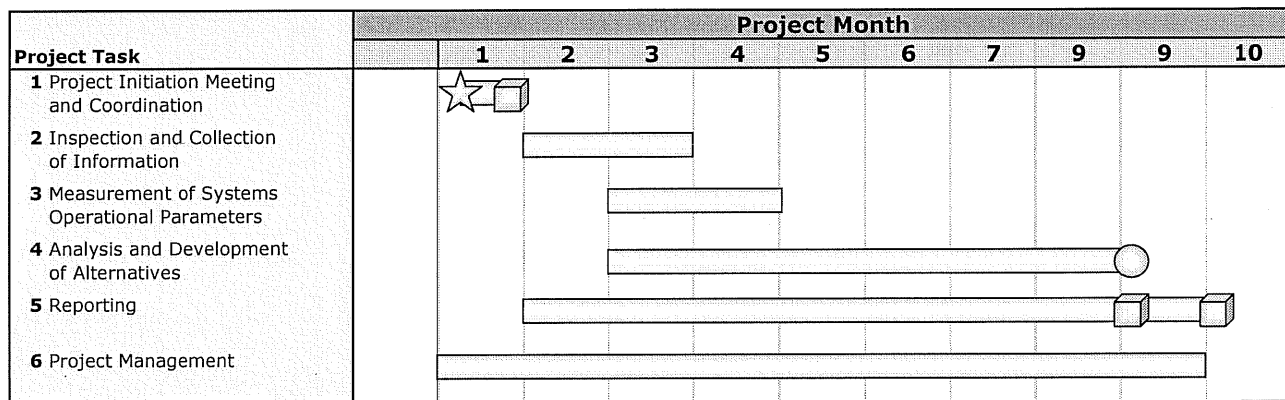
Consultant shall closely follow the tasks and activities, as agreed upon in Task 1. Before the start of each task, Dr. Ganji and Mr. Joyce shall plan the details of the task's activities together and assign the needed personnel from the respective companies. The plan of activities shall then be submitted to the City's project manager for comment and approval. The plans shall be finalized after any modifications based on City comments. For each task (in cases for some activities) a senior engineer shall be assigned as manager and responsible for coordination with City personnel.

BASE and Kennedy Jenks project managers shall be in contact on a regular basis (at least weekly) to coordinate the activities and resolve any issues and difficulties. BASE project manager shall submit monthly progress reports to the City's project manager. All reports shall be reviewed for content, accuracy and language by respective project managers, and finally by lead consultant project manager.

## EXHIBIT A-1

### Project Schedule

The total time to accomplish the objectives of the project is estimated to be nine months from the date of the project initiation meeting. The time-line will be finalized in Task 1 of the project. The following chart shows the proposed schedule of the project.



#### Milestones



Project Kickoff Meeting



Completion of Alternatives Analysis



Initial Tech Memo and Draft / Final Reports

## EXHIBIT B - PROJECT BUDGET

Budget Estimate for Energy Audit of Sunnyvale WPCP Hot Water Loop Submitted by BASE Energy, Inc.

### Task 1 - Project Initiation Meeting and Coordination

		\$/hr	Hours	Base Labor Cost(\$)	Totals
BASE					
	Principal	135	12	1620	
	Senior Engineer	100	12	1200	
	Engineer	85	8	680	
Task 1 - Subtotal BASE					3500
KJ					
	Eng-Sci-Spec 8	185	8	1480	
	Eng-Sci-Spec 7	170	6	1020	
	Eng-Sci-Spec 4	120	12	1440	
	Project Admin	75	2	150	
Task 1 - Subtotal KJ					4090
Task 1 - Subtotal					7590

### Task 2 - Inspection and Collection of Information

BASE					
	Principal	135	16	2160	
	Senior Engineer	100	40	4000	
	Engineer	85	40	3400	
Task 2 - Subtotal BASE					9560
KJ					
	Eng-Sci-Spec 8	185	4	740	
	Eng-Sci-Spec 7	170	24	4080	
	Eng-Sci-Spec 5	135	4	540	
	Engi-Sci-Spec 4	120	24	2880	
	Project Admin	75	2	150	
Task 2 - Subtotal KJ					8390
Task 2 - Subtotal					17950

### Task 3 - Measurement of Operational Parameters

BASE					
	Principal	135	16	2160	
	Senior Engineer	100	24	2400	
	Engineer	85	64	5440	
Task 3 - Subtotal BASE					10000
KJ					
	Eng-Sci-Spec 8	185	8	1480	
	Eng-Sci-Spec 7	170	40	6800	
	Eng-Sci-Spec 5	135	24	3240	
	Engi-Sci-Spec 4	120	24	2880	
	Project Admin	75	2	150	
Task 3 - Subtotal KJ					14550
Task 3 - Subtotal					24550

**EXHIBIT - Page 2**

**Task 4 - Analysis and Development of Alternatives**

**BASE**

Principal	135	40	5400
Senior Engineer	100	180	18000
Engineer	85	180	15300

Task 4 - Subtotal BASE 38700

**KJ**

Eng-Sci-Spec 8	185	16	2960
Eng-Sci-Spec 7	170	50	8500
Eng-Sci-Spec 5	135	12	1620
Engi-Sci-Spec 4	120	60	7200
Engi-Sci-Spec 3	108	24	2592
Project Admin	75	8	600

Task 4 - Subtotal KJ 23472

Task 4 - Subtotal **62172**

**Task 5 - Reporting**

**BASE**

Principal	135	50	6750
Senior Engineer	100	60	6000
Engineer	85	40	3400

Task 5 - Subtotal BASE 16150

**KJ**

Eng-Sci-Spec 8	185	16	2960
Eng-Sci-Spec 7	170	40	6800
Eng-Sci-Spec 5	135	4	540
Engi-Sci-Spec 4	120	40	4800
Project Admin	75	8	600

Task 5 - Subtotal KJ 15700

Task 5 - Subtotal **31850**

**Task 6 - Project Management**

**BASE**

Principal	135	40	5400
Senior Engineer	100	24	2400

Task 5 - Subtotal BASE **7800**

Subcontract for Engines Inspection	8,000
Subcontract for Corrosion Inspection	10,000
Subcontract for Structural Inspection	10,000
Miscellaneous Costs*	5,000

**Total Cost to the City 184,912**

**Notes:**

- 1 - Labor costs include direct cost, overhead and fee.
- 2 - Subcontractor's costs include 5% administration fee.

\* Miscellaneous costs include transportation (based on IRS mileage rate), any special testing or instrumentation, etc.

**Exhibit "C"**  
**INSURANCE REQUIREMENTS**

On or before beginning any of the services or work called for by any term of this Agreement, CONSULTANT, at its own cost and expense, shall carry, maintain for the duration of the Agreement, and provide proof thereof that is acceptable to CITY, the insurance specified in Paragraphs A through C below with insurers and under forms of insurance satisfactory in all respects to CITY. CONSULTANT shall not allow any subcontractor to commence work on any subcontract until all insurance required of CONSULTANT has also been obtained for the subcontractor.

- A. Workers' Compensation. Statutory Workers' Compensation Insurance and Employer's Liability Insurance for any and all persons employed directly or indirectly by CONSULTANT shall be provided with limits not less than one million dollars (\$1,000,000.00). In the alternative, CONSULTANT may rely on a self-insurance program to meet these requirements so long as the program of self-insurance complies fully with the provisions of the California Labor Code. The insurer, if insurance is provided, or CONSULTANT, if a program of self-insurance is provided, shall waive all rights of subrogation against CITY for loss arising from work performed under this Agreement.
- B. Commercial General and Automobile Liability. CONSULTANT shall maintain Commercial General and Automobile Liability Insurance for the period covered by this Agreement in an amount not less than one million dollars (\$1,000,000.00) per occurrence, combined single limit coverage for risks associated with the work contemplated by this Agreement. If a Commercial General Liability Insurance or an Automobile Liability Insurance form or other form with a general aggregate limit is used, either the general aggregate limit shall apply separately to the work to be performed under this Agreement or the general aggregate limit shall be at least twice the required occurrence limit. Such coverage shall include, but shall not be limited to, protection against claims arising from bodily and personal injury, including death resulting therefrom, and damage to property resulting from activities contemplated under this Agreement, including the use of owned and non-owned automobiles.

Coverage shall be at least as broad as Insurance Services Office Commercial General Liability occurrence form CG 0001 (ed. 11/88) and Insurance Services Office Automobile Liability form CA 0001 (ed. 12/90) Code 1 (any auto).

Each of the following shall be included in the insurance coverage or added as an endorsement to the policy:

1. CITY, its officers, employees, agents, and volunteers are to be covered as insureds as respects each of the following: liability arising out of activities performed by or on behalf of CONSULTANT, including the insured's general supervision of CONSULTANT; products and completed operations of CONSULTANT; premises owned, occupied or used by CONSULTANT; or automobiles owned, leased, hired, or borrowed by CONSULTANT. The coverage shall contain no special limitations on the scope of protection afforded to CITY, its officers, employees, agents, or volunteers.
2. The insurance shall cover on an occurrence basis and not on the basis of an accident or claims made.
3. The insurance must cover personal injuries as well as bodily injuries. Any exclusion of contractual liability in personal injury provisions of the policy or any endorsement to it must be eliminated.
4. The insurance must cover complete contractual liability. This may be provided by amending the definition of "incidental contract" to include any written agreement.
5. Any explosion, collapse, and underground property damage exclusion must be deleted.

6. An endorsement must state that coverage is primary insurance and that no other insurance affected by CITY will be called upon to contribute to a loss under the coverage.
7. The policy must contain a cross liability or severability of interests clause.
8. Any failure of CONSULTANT to comply with reporting provisions of the policy shall not affect coverage provided to CITY and its officers, employees, agents, and volunteers.
9. Broad form property damage liability must be afforded. A deductible that does not exceed twenty-five thousand dollars (\$25,000.00) may be provided.
10. Insurance is to be placed with California- admitted insurers with a Best's rating of no less than B:XI.
11. Notice of cancellation or non-renewal must be received by CITY at least thirty (30) days prior to such change.

C. Professional Liability. CONSULTANT shall maintain for the period covered by this Agreement Professional Liability Insurance for licensed professionals performing work pursuant to this Agreement in an amount not less than one million dollars (\$1,000,000.00) covering the licensed professionals' errors and omissions, as follows:

1. Any deductible shall not exceed one hundred thousand dollars (\$100,000.00) per claim.
2. Notice of cancellation or non-renewal must be received by CITY at least thirty (30) days prior to such change.
3. If the professional liability coverages are written on an occurrence form, the policy must contain a cross liability or severability of interest clause.
4. The following provisions shall apply if the professional liability coverages are written on a claims made form:
  - a. The retroactive date of the policy must be shown and must be before the date of the Agreement.
  - b. Insurance must be maintained and evidence of insurance must be provided for at least five years after completion of the Agreement or the work.
  - c. If coverage is canceled or not renewed and it is not replaced with another claims made policy form with a retroactive date that precedes the date of this Agreement, CONSULTANT must provide extended reporting coverage for a minimum of five years after completion of the Agreement or the work.
  - d. A copy of the claim reporting requirements must be submitted to CITY prior to the commencement of any work under this Agreement.

D. Deductibles and Self-Insured Retentions. During the period covered by this Agreement, upon express written authorization of CITY's City Attorney, CONSULTANT may increase such deductibles or self-insured retentions with respect to CITY, its officers, employees, agents, and volunteers. The City Attorney may condition approval of an increase in deductible or self-insured retention levels upon a requirement that CONSULTANT procure a bond guaranteeing payment of losses and related investigations, claim administration, and defense expenses that is satisfactory in all respects to each of them.



- E. Notice of Reduction in Coverage. In the event that any coverage required under Paragraphs A, B, or C above is reduced, limited, or materially affected in any other manner, CONSULTANT shall provide written notice to CITY at CONSULTANT's earliest possible opportunity and in no case later than five days after CONSULTANT is notified of the change in coverage.
- F. Failure to Provide or Maintain Insurance. In addition to any other remedies CITY may have if CONSULTANT fails to provide or maintain any insurance policies or policy endorsements to the extent and within the time herein required, CITY may, at its sole option:
1. Obtain such insurance and deduct and retain the amount of the premiums for such insurance from any sums due under the Agreement;
  2. Order CONSULTANT to stop work under this Agreement or withhold any payment which becomes due to CONSULTANT hereunder, or both stop work and withhold any payment, until CONSULTANT demonstrates compliance with the requirements hereof;
  3. Terminate this agreement.

Exercise of any of the above remedies, however, is an alternative to other remedies CITY may have and is not the exclusive remedy for CONSULTANT's failure to maintain insurance or secure appropriate endorsements.